Assignment 4

Textbook Assignment: "Measurement and Pressure Control Devices," Chapter 8: "Reservoirs, Strainers, Filters, and Accumulators," chapter 9; and "Actuators," chapter 10.

Learning Objective: Recognize the construction, operational characteristics, and uses of different types of fluid pressure indicators, thermometers, and control switches.

4-1. The pressure sensing elements of Bourdon-tube gauges are commonly made in which of the following shapes?

1. The letter C
2. Helical
3. Spiral
4. All of the above

4-2. Which, if any, of the following statements correctly explains the action of a C-shaped Bourdon tube?

1. Centrifugal force of fluid flowing through the curved tube causes it to straighten out
2. Pressure applied to the tube causes its cross section to become more circular, causing It to straighten out
3. Pressure applied to the tube causes its cross section to become more circular, causing it to contract
4. None of the above

4-3. A duplex Bourdon gauge is composed of

1. one indicator dependent upon both of two separate mechanisms
2. two separate and independent mechanisms and indicators
3. one mechanism with one indicator showing current pressure and a second indicator showing the maximum pressure reached
4. one mechanism with one indicator showing pressure in pounds per square inch (psi) and a second indicator showing the load on a ram in tons

4-4. A Bourdon-tube differential pressure gauge is composed of

1. one indicator dependent upon both of two separate mechanisms
2. two separate and independent mechanisms and indicators
3. one mechanism with one indicator showing current pressure and the second indicator showing the maximum pressure reached
4. one mechanism with one indicator which can register pressure either above or below atmospheric pressure

4-5. Which of the following gauges can be used to measure the differential pressure across a strainer?

1. Duplex gauge
2. Differential pressure gauge
3. Both 1 and 2 above
4. Compound gauge

4-6. Which of the following statements describes hydraulic pressure gauges?

1. The tube is designed for hydraulic fluids only
2. The gauge is designed to operate at higher pressures
3. Some gauges are designed with a special type of spring-loaded linkage to prevent damage
4. All of the above

4-7. Gauges having bellows elements are used only for pressure indicating.

1. True
2. False

4-8. Which of the following is NOT a function of pressure switches?

1. Indicating pressure
2. Energizing an auxiliary control system
3. De-energizing an auxiliary control system
4. Signaling a visual warning or audible alarm when a preset pressure is reached

4-9. The pressure switch sensing element operates on the same principle as the Bourdon-tube pressure gauge.

1. True
2. False

4-10. A change in which of the following properties is the basis of operation of the bimetallic thermometer?

1. Chemical
2. Electrical
3. Physical
4. All of the above

4-11. What is the maximum length, in feet, of the capillary tube of distant-reading thermometers?

1. 50
2. 75
3. 100
4. 125

4-12. Distant-reading thermometers operate similarly to Bourdon-tube pressure gauges.

1. True
2. False

4-13. In the operation of pressure gauges within a hydraulic system, what does a gauge snubber do?

1. Dampens out system pressure surges and oscillations to the gauge, thereby preventing internal damage
2. Prevents hydraulic pressure indicators from oscillating, thereby ensuring an accurate system pressure reading
3. Both 1 and 2 above
4. Meters the flow of pressurized hydraulic fluid from the gauge or transmitter, thereby preventing internal damage

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Learning Objective: Recognize functions, operating requirements and characteristics, and construction features of hydraulic reservoirs and the functions of related components.

4-14. The reservoir serves the primary function of storing the hydraulic fluid required by the system, Which of the following secondary functions does it also serve?

1. Separates air from the system
2. Dissipates heat
3. Traps foreign matter
4. All of the above

4-15. The baffles In a reservoir serve which of the following functions?

1. Dissipate heat
2. Trap foreign matter
3. Separate air form the system
4. All of the above

4-16. Which of the following factors must be considered In determining the reservoir capacity of a hydraulic system?

1. The thermal expansion of the fluid
2. Whether the system is fixed or mobile
3. The volume of fluid required by the system
4. All of the above

4-17. Why must the reservoir of an aircraft designed for high-altitude operations be pressurized?

1. To maintain a net positive suction head to the pump
2. To use atmospheric pressure to assist fluid flow
3. To prevent the fluid from congealing at high altitudes
4. To vent the system during periods of high fluid demand

4-18. A pressurized reservoir may be Instead at a level below the pump suction and still maintain a positive flow of fluid to the pump.

1. True
2. False

Learning Objective: Identify operating principles and applications of accumulators.

4-19. Hydraulic systems are equipped with one or more accumulators that serve to perform which of the following functions?

1. To provide pressure for emergency operation of the system in the event of system failure
2. To act as a buffer and absorb surges and shock pressures that might damage pipes and other components of the system
3. To equalize and readjust for any pressure losses in the system due to small leaks and thermal reaction of the fluid
4. All of the above

4-20. Which of the following statements best describe(s) the advantage a vented tailrod accumulator has over a floating piston accumulator?

1. The tailrod allows the accumulator to be used as a hydraulic actuator, thus eliminating the number of system components requiring maintenance
2. The vented tailrod accumulator has the space between the piston seals vented to the atmosphere, causing air or oil leakage past the seals to be apparent
3. Both 1 and 2 above
4. The vented tailrod accumulator has a gauge that provides a quick indication of the amount of fluid in the accumulator

4-21 Why does a bladder-type, air-operated accumulator have a very high volumetric efficiency?

1. The bladder is larger at the bottom and the rubber is thinner at the top
2. The bladder is larger at the top and the rubber is thinner at the bottom’
3. The bladder is larger at the top and the rubber is thinner at the top
4. The bladder is larger at the bottom and the rubber is thinner at the bottom

4-22. Which of the following statements describe(s) how an excessive amount of gas is prevented from being entrained In direct-contact accumulators?

1. Safety fluids are used in this type of accumulator
2. The fluid port is located at the bottom of the accumulator
3. These accumulators are generally not used for pressures over 1200 psi
4. All of the above

4-23. Both the bladder-type accumulator and the diaphragm accumulator operate in a similar manner.

1. True
2. False

Learning Objective: Recognize the effects of foreign matter on filtration in a hydraulic power system Recall the functions, construction features, and operating characteristic of filters, strainers, and dehydrators.

4-24. A filter should be used to remove large particles of foreign matter from the fluid in a hydraulic power system.

1. True
2. False

4-25. To prevent the higher differential pressure that is generated at cold temperatures by high fluid viscosity from causing a false indication of a loaded filter element, what device is installed in the button-type pressure differential indicator?

1. Thermal lockout
2. Viscosity sensor
3. Collapsible filter element
4. Pressure-operated bypass valve

4-26. Nonbypassing filters are used in a hydraulic system to serve which of the following functions?

1. Decrease the frequency of flushing the system
2. Reduce the probability of the failure of other system components
3. Reduce the circulation of contaminated fluid in the system
4. All of the above

4-27. How is the bypass valve, located within the head assembly of some filters, operated?

1. Manually
2. Pressure
3. Electrically
4. Magnetically

4-28. When you find a filter differential pressure indicator button extended, what is the first action you should take?

1. Replace the indicator
2. Replace the filter el
3. Replace the filter assembly
4. Verify that the releace of the button is due to a loaded filter element

4-29. The recirculation of fluid through a proportional-flow filter over a period of time will eventually accomplish the same purpose as passage of the fluid once through a full flow filter.

1. True
2. False

4-30. The diameter, in microns, of the largest spherical particle that will pass through a filter under a certain test condition defines what filtration rating?

1. Mean
2. Nominal
3. Absolute
4. Adequate

4-31. Which of the following types of filter elements would most likely be found in the air intake of a compressor?

1. Ceramic
2. Porous metal
3. Woven screen wire
4. Moving mechanical device

4-32. Some pneumatic systems use chemical driers to remove any moisture that might collect in the lines beyond the water separators. The driers remove this moisture by what process?

1. Absorption
2. Condensation
3. Evaporation
4. Precipitation

4-33. The chemical driers referred to in the preceding question may be identified by which of the following terms?

1. Air driers
2. Desiccators
3. Dehumidifiers
4. Each of the above

Learning Objective: Recognize the types of fluid power actuating devices and identify construction features, uses, and operating characteristics of various types of actuating cylinders.

4-34. What component of a fluid power system converts fluid power into mechanical force and motion?

1. Pump
2. Valve
3. Actuator
4. Solenoid

4-35. What actuating devices are commonly used in fluid power systems?

1. Turbines
2. Motors
3. Cylinders
4. All of the above

4-36. A cylinder is identified as a ram type if its

1. piston rod diameter is less than one-half of the diameter of the piston
2. piston rod area is less than On-half the area of it
3. area is more than one-half of the area of the piston rod
4. piston rod cross-sectional area exceeds one-half of the cross-sectional area of the piston

4-37. Ram-type sinqle-acting cylinders are designed for which type of functions?

1. Push functions where springs assist the functions
2. Pull functions where springs assist the functions
3. Push functions where return action depends on springs or gravity
4. Pull functions where return action depends on springs or gravity

4-38. Four-way control valves are normally used to control the actions of the

1. single–acting ram
2. double-acting ram
3. sinqle-acting ram through two ports
4. double–acting ram using equal pressure on all valve surfaces

4-39. Refer to figure 10-2 of your textbook. Why does the extension stroke exert a greater force than the retraction stroke?

1. The pressure is much greater for the extension stroke
2. The bottom of the ram has a larger surface area than the lip
3. Both pressure and surface area are greater for the extension stroke
4. The extension stroke is usually assisted by gravity

IN QUESTIONS 4-40 THROUGH 4-42 SELECT FROM COLUMN B AN APPLICATON OF EACH TYPE OF ACTUATING CYLINDER LISTED IN COLUMN A.

A. CYLINDER TYPES	B. APPLICATIONS
4-40. Sinqle–acting. spring-loaded piston	1. Dump trucks
4-41. Telescoping ram	2. Ships' steer. ing systems
4-42. Dual ram	3. Anchor wind- lass
	4. Carrier air- craft arrest- ing hooks

4-43. The piston-type cylinder has a cross-sectional area that measures more than twice the cross-sectional area of its piston rod.

1. True
2. False

4-44. Refer to figure 10-5 in your textbook. Which statement relative to the operation of this cylinder is correct?

1. Fluid pressure extends and returns the rod
2. Fluid pressure extends the rod and gravity returns it
3. Mechanical force extends the rod and fluid pressure returns it
4. Fluid pressure extends the rod and mechanical force returns it

4-45. What type of directional control valve is normally used to control a single-acting, spring-loaded, piston-type actuating cylinder?

1. Shuttle
2. Transfer
3. Three-way
4. Four-way

4-46. Refer to figure 10-6 of your textbook. This type of cylinder is normally installed so that the greater load is carried as the piston travels in which direction?

1. To the right
2. To the left
3. To either the right or left: it does not matter since the same pressure is applied to both sides of the piston

4-47. Refer to figures 10-6 and 10-8 in your textbook. A double-acting unbalanced cylinder differs from a double-acting balanced cylinder in that the balanced cylinder has

1. equal, opposing piston surfaces
2. unequal piston rod areas
3. unequal piston surface areas
4. springs to equalize pressures on the piston

4-48. Rotary actuation of fluid power equipment can be done only with the use of fluid power motors.

1. True
2. False

4-49. Although pumps and fluid power motors are similar in design and construction, the function of each is the direct opposite to that of the other.

1. True
2. False

4-50. Which of the following operational conditions are provided by a fixed-displacement fluid motor?

1. Variable torque and constant speed
2. Constant torque and constant speed
3. Constant torque and variable speed
4. Variable torque and variable speed

4-51. In a system requiring rotation of a motor in one direction, fluid flow to the motor can be controlled by which of the following components?

1. A flow control valve
2. A variable-displacement pump
3. A two-way directional cantrol valve
4. Each of the above

4-52. Although hydraulic systems use all of the following types of fluid power motors, pneumatic systems are limited to using which type?

1. Vane
2. Gear
3. Radial piston
4. Axial piston

4-53. Refer to figure 10-12 in your textbook. Which statement about the gears is true?

1. Both 1 and 2 are driving gears
2. Both 1 and 2 are driven gears
3. 1 is the driven gear and 2 is the driving gear
4. 1 is the driving gear and 2 is the driven gear

4-54. Which of the following statements concerning the operation of the vane-type motor illustrated in figure 10-13 of your textbook is false?

1. The rotor turns because area A is greater than area B
2. The pressure of the driving force is equal in all directions
3. When the rotor turns clockwise, the vanes tend to bend backward due to centrifugal force
4. The potential energy of the driving force is converted into kinetic energy in the form of rotary motion and force

4-55. Piston-type motors and variable-displacement pumps are often combined to form a hydraulic transmission. The advantages of such a transmission over a mechanical transmission include which of the following?

1. Smooth acceleration and deceleration
2. Shock load effect reduction
3. Smooth operating action
4. All of the above

REFER TO FIGURE 10-16 IN YOUR TEXTBOOK IN ANSWERING QUESTIONS 4-56 THROUGH 4-58.

4-56. The direction of the hydraulic motor is controlled by which of the following components?

1. Electric motor
2. Hydraulic pump
3. Prime mover
4. B-end

4-57. Which of the following statements concerning the design of the hydraulic transmission illustrated in figure 10-16 of your textbook is true?

1. The A-end is a variable-displacement axial-piston motor, and the B-end is a fixed-displacement axial-piston pump
2. The A-end is a fixed-displacement axial-piston pump, and the B-end is a variable-displacement axial-piston motor
3. The A-end is a variable-displacement axial-piston pump, and the B-end is a fixed-displacement axial-piston motor
4. The A-end is a fixed-displacement axial-piston motor, and the B-end is a variable displacement axial-piston pump

4-58. The B-end of the speed gear is a fixed-displacement motor whose pistons make a full stroke for every revolution of the output shaft

1. True
2. False

Learning Objective: Identify functions, operating characteristics, and construction features of various types of turbines.

4-59. Which of the following is NOT a use of turbines?

1. Convert kinetic energy of gas to mechanical energy
2. Supply fluid flow in hydraulic systems
3. Drive electric generators
4. Drive pumps

4-60. Which of the following turbine parts convert(s) kinetic energy to mechanical energy?

1. Blade
2. Nozzle
3. Both 1 and 2 above
4. Rotor

4-61. Which of the following forces causes the reaction turbine to rotate?

1. Reactive force produced on the moving blades as the gas increases in velocity
2. Reactive force produced on the moving blades as the gas changes direction
3. The impulse of the gas impinging upon the moving blades
4. Each of the above

4-62. The nozzles of a reaction turbine are mounted between the blades.

1. True
2. False